

Work sheet 7 Sol'ns

1

$$\textcircled{1} \quad x=3 \text{ for } \frac{-3x}{3x+2} \rightarrow \frac{-3(3)}{3(3)+2} = \boxed{\frac{-9}{11}}$$

$$\textcircled{2} \quad x=3 \text{ for } \frac{2x^2-4}{x^2-2} = \frac{2(3)^2-4}{(3)^2-2} = \frac{14}{7} = \boxed{2}$$

$$\textcircled{3} \quad \frac{4x+3}{x^2+x-12} \text{ is undefined when } x^2+x-12=0 \text{ (denominator=0)}$$

$$(x+4)(x-3)=0$$

$$x+4=0 \quad x-3=0$$

$$\boxed{x=-4} \quad \boxed{x=3}$$

$$\textcircled{4} \quad \frac{x+5}{x^3+9x^2+18x} \text{ is undefined when}$$

$$x^3+9x^2+18x=0$$

$$x(x^2+9x+18)=0$$

$$x(x+6)(x+3)=0$$

$$x=0 \quad x+6=0 \quad x+3=0$$

$$\boxed{\begin{matrix} x=0 \\ x=-6 \\ x=-3 \end{matrix}}$$

$$\textcircled{5} \quad \frac{15ab^3c^9}{-24ab^2c^{10}} = \frac{\cancel{3} \cdot 5 \cdot \cancel{a} \cdot \cancel{b^3} \cdot \cancel{c^9}}{\cancel{-3} \cdot 8 \cdot \cancel{a} \cdot \cancel{b^2} \cdot \cancel{c^{10}}} = \boxed{\frac{5b}{-8c}}$$

$$\textcircled{6} \quad \frac{(b^2+2b-15)}{b^2+9b+20} = \frac{(b+5)(b-3)}{(b+5)(b+4)} = \boxed{\frac{b-3}{b+4}}$$

$$\textcircled{7} \quad \frac{v \cdot w - 5v + 3w - 15}{v \cdot w - 5v + 2w + 10} = \frac{v(w-5) + 3(w-5)}{v(w-5) + 2(w-5)} = \frac{(w-5)(v+3)}{(w-5)(v+2)} = \boxed{\frac{v+3}{v+2}}$$

$$\textcircled{8} \quad \frac{4x+1}{5x-3} = \frac{-(-4x-1)}{5x-3} = \frac{4x+1}{-(-5x+3)}$$

$$= \frac{-4x-1}{-(5x-3)} = \frac{-(4x+1)}{-5x+3}$$

$$\begin{aligned} \textcircled{9} \quad -\frac{2x+6}{x-5} &= \frac{-(2x+6)}{x-5} = \frac{-2x-6}{x-5} \\ &= \frac{2x+6}{-(x-5)} = \frac{2x+6}{-x+5} \end{aligned}$$

$$\textcircled{10} \quad \frac{6}{9y+36} \cdot \frac{4y+16}{9} = \frac{6}{9} \cdot \frac{4(y+4)}{9(y+4)} = \frac{2}{3} \cdot \frac{4}{9} = \boxed{\frac{8}{27}}$$

$$\begin{aligned} \textcircled{11} \quad \frac{3x^2-12}{x^2-x-6} \cdot \frac{x^2-6x+9}{2x-4} &= \frac{3(x^2-4)}{(x-3)(x+2)} \cdot \frac{(x-3)^2}{2(x-2)} \\ &= \frac{3(x+2)(x-2)(x-3)^2}{2(x+2)(x-2)(x-3)} = \boxed{\frac{3(x-3)}{2}} \end{aligned}$$

$$\textcircled{12} \quad \frac{m^2-16}{m-3} \cdot \frac{m^2-9}{m+4} = \frac{(m-4)(m+4)}{(m+4)} \cdot \frac{(m-3)(m+3)}{(m-3)} = \boxed{(m-4)(m+3)}$$

$$\textcircled{13} \quad \frac{6z^3}{9zw} \div \frac{z^7}{21 \cdot zw^2} = \frac{6z^3}{9z \cdot w} \cdot \frac{21 \cdot zw^2}{z^7} = \frac{\cancel{3} \cdot \cancel{6} \cdot 7 \cdot \cancel{z} w^2}{\cancel{3} \cdot \cancel{3} \cdot z^4 w} = \frac{2 \cdot 7}{z^4} = \boxed{\frac{14}{z^4}}$$

$$\begin{aligned} \textcircled{14} \quad \frac{9a^2-1}{9a^2-6a+1} \div \frac{3a^2-11a-4}{12a^2+5a-3} &= \frac{(3a-1)(3a+1)}{(3a-1)(3a-1)} \div \frac{(3a+1)(a-4)}{(3a-1)(4a+3)} \\ &= \frac{(3a+1)}{(3a-1)} \cdot \frac{(3a-1)(4a+3)}{(3a-1)(a-4)} \\ &= \boxed{\frac{4a+3}{a-4}} \end{aligned}$$

$$\textcircled{15} \quad \text{Find LCD of } \frac{15}{7t-28} \text{ \& } \frac{21}{6t-24}$$

$$7t-28 = 7(t-4)$$

$$6t-24 = 6(t-4)$$

$$\text{LCD} = \boxed{7 \cdot 6 \cdot (t-4)}$$

(16) Find LCD of $\frac{v-4}{3v^4-6v^3}$, $\frac{v+2}{v^2+2v-8}$

$$3v^4-6v^3 = 3v^3(v-2)$$

$$v^2+2v-8 = (v+4)(v-2)$$

$$\text{LCD} = \boxed{3v^3(v-2)(v+4)}$$

(17) Find LCD of $\frac{17r}{9r^2-6r-8}$ & $\frac{-13r}{9r^2-9r-4}$

$$9r^2-6r-8 = (3r-4)(3r+2)$$

$$9r^2-9r-4 = (3r-4)(3r+1)$$

$$\text{LCD} = \boxed{(3r-4)(3r+2)(3r+1)}$$

(18) $\frac{8z}{3z+3} = \frac{?}{12z^2+15z+3}$

$$\rightarrow \frac{8z}{3(z+1)} = \frac{?}{(3)(z+1)(4z+1)}$$

$$\text{so } ? = \boxed{8z(4z+1)} = \boxed{32z^2+8z}$$

(19) $\frac{3}{k^2+3k} = \frac{?}{k^3+10k^2+21k}$

$$\rightarrow \frac{3}{k(k+3)} = \frac{?}{k(k+3)(k+7)}$$

$$? = \boxed{3(k+7)} = \boxed{3k+21}$$

(20) $\frac{x}{x^2-4} + \frac{7x}{x^2-4} = \boxed{\frac{8x}{x^2-4}}$

(21) $\frac{2x}{9x^2-25y^2} + \frac{x-5y}{9x^2-25y^2} = \frac{3x-5y}{9x^2-25y^2} = \frac{(3x-5y)}{(3x-5y)(3x+5y)} = \frac{1}{3x+5y}$

(22) $\frac{3z-2}{5z+20} + \frac{2z+1}{3z+12} = \frac{3z-2}{5(z+4)} + \frac{(2z+1)}{3(z+4)}$ $\text{LCD} = 5 \cdot 3(z+4)$

$$= \frac{(3z-2)}{5(z+4)} \cdot \frac{3}{3} + \frac{(2z+1)}{3(z+4)} \cdot \frac{5}{5}$$

$$= \frac{3(3z-2) + 5(2z+1)}{3 \cdot 5 \cdot (z+4)} = \rightarrow \text{Cont}$$

$$(22) \text{ Cont } \frac{3(3z-2) + 5(2z+1)}{3 \cdot 5 \cdot (z+4)}$$

$$= \frac{9z-6+10z+5}{3 \cdot 5 \cdot (z+4)} = \boxed{\frac{19z-1}{3 \cdot 5 \cdot (z+4)}}$$

$$(23) \frac{5p-2}{2p^2+9p+9} + \frac{p+7}{6p^2+13p+6} = \frac{5p-2}{(p+3)(2p+3)} + \frac{p+7}{(2p+3)(3p+2)}$$

$$\text{LCD: } (p+3)(2p+3)(3p+2)$$

$$\rightarrow \frac{(5p-2)(3p+2)}{(p+3)(2p+3)(3p+2)} + \frac{(p+7)(p+3)}{(p+3)(2p+3)(3p+2)}$$

$$= \frac{(15p^2+4p-4) + (p^2+10p+21)}{(p+3)(2p+3)(3p+2)} = \boxed{\frac{16p^2+14p+17}{(p+3)(2p+3)(3p+2)}}$$

$$(24) \frac{2x}{x^2+3x-10} - \frac{x+2}{x^2+3x-10} = \frac{2x-(x+2)}{x^2+3x-10} = \frac{(x-2)}{(x-2)(x+5)} = \boxed{\frac{1}{x+5}}$$

$$(25) \frac{m}{m^2-4} - \frac{1-m}{m^2+4m+4} = \frac{m}{(m+2)(m-2)} - \frac{-(m-1)}{(m+2)(m+2)} \quad \text{LCD} = (m+2)^2(m-2)$$

$$= \frac{m(m+2)}{(m-2)(m+2)^2} + \frac{(m-1)(m-2)}{(m-2)(m+2)^2} = \frac{2m^2-m+2}{(m-2)(m+2)^2}$$

$$= \frac{m(m+2) + (m-1)(m-2)}{(m-2)(m+2)^2} = \boxed{\frac{2m^2-m+2}{(m-2)(m+2)^2}}$$

$$(26) \frac{3}{n^2-16} - \frac{6n}{n^2+8n+16} = \frac{3}{(n+4)(n-4)} - \frac{6n}{(n+4)^2} \quad \text{LCD} = (n-4)(n+4)^2$$

$$= \frac{3(n+4)}{(n-4)(n+4)^2} - \frac{6n(n-4)}{(n-4)(n+4)^2}$$

$$= \boxed{\frac{-6n^2+27n+12}{(n-4)(n+4)^2}}$$

$$(27) \quad \frac{\left(\frac{3}{4} - \frac{1}{2}\right)}{\left(\frac{1}{4} + \frac{5}{8}\right)}$$

method #2

LCD = 8 = 2 · 2 · 2 of all fractions

$$\frac{\cancel{\frac{3 \cdot 2}{4 \cdot 2}} - \cancel{\frac{1 \cdot 4}{2 \cdot 4}}}{\cancel{\frac{1 \cdot 2}{4 \cdot 2}} + \frac{5}{8}} = \frac{8\left(\frac{3}{4} - \frac{1}{2}\right)}{8\left(\frac{1}{4} + \frac{5}{8}\right)} = \frac{\frac{8 \cdot 3}{4} - \frac{8}{2}}{\frac{8}{4} + \frac{8 \cdot 5}{8}} = \frac{2 \cdot 3 - 4}{2 + 5} = \boxed{\frac{-2}{3}}$$

$$(28) \quad \frac{\frac{2}{a+2} - 4}{\frac{1}{a+2} - 3}$$

Method #1

$$\text{Num: } \frac{2}{a+2} - 4 \Rightarrow \frac{2}{a+2} - \frac{4(a+2)}{(a+2)} = \frac{-6-4a}{a+2}$$

$$\text{Denom: } \frac{1}{a+2} - 3 \Rightarrow \frac{1}{a+2} - \frac{3(a+2)}{(a+2)} = \frac{\cancel{3a+6} - 3a - 5}{a+2}$$

Rewrite:

$$\frac{\frac{-6-4a}{a+2}}{\frac{3a+6}{a+2}} \Rightarrow \frac{-6-4a}{a+2} \cdot \frac{a+2}{\cancel{3a+6} - 3a - 5} = \boxed{\frac{-2(1+2a)}{3(a+2)}} = \boxed{\frac{-4a-6}{-3a-5}}$$

method #2 LCD = (a+2) for all fractions

$$\frac{(a+2) \cdot \frac{2}{a+2} - (a+2) \cdot 4}{(a+2) \cdot \frac{1}{a+2} - (a+2) \cdot 3} = \frac{2 - 4a - 8}{1 - 3a - 6} = \boxed{\frac{-4a-6}{-3a-5}}$$

$$(29) \quad \frac{\frac{a^2}{b}}{\frac{a^2}{b^2}} = \frac{a^2}{b} \cdot \frac{b^2}{a^2} = \boxed{b}$$

$$(30) \quad \frac{\frac{15}{10k+10}}{\frac{5}{3k+3}} = \frac{15}{10(k+1)} \cdot \frac{3(k+1)}{5} = 3 \cdot 3 = \boxed{9}$$

31

$$\frac{3x}{5} - \frac{4x}{3} = \frac{22}{15}$$

$$\text{LCD} = 3 \cdot 5$$

$$\frac{(3 \cdot 5)}{1} \frac{3x}{5} - \frac{4x}{3} \cdot \frac{(3 \cdot 5)}{1} = \frac{22}{15} \cdot \frac{3 \cdot 5}{1}$$

$$-11x = 22$$

$$\boxed{x = -2}$$

$$3 \cdot 3x - 4x \cdot 5 = 22$$

$$9x - 20x = 22$$

32

$$\frac{9}{x^2 - x - 12} = \frac{3}{x-4} - \frac{x}{x+3}$$

$$\text{LCD} = (x-4)(x+3)$$

$$\frac{(x-4)(x+3)}{1} \frac{9}{(x-4)(x+3)} = \frac{3}{(x-4)} \frac{(x-4)(x+3)}{1} - \frac{x}{(x+3)} \frac{(x-4)(x+3)}{1}$$

$$9 = 3(x+3) - x(x-4)$$

$$9 = 3x + 9 - x^2 + 4x$$

$$9 = 9 + 7x - x^2$$

$$0 = x(7-x)$$

$$\boxed{x=0} \quad 7-x=0$$

$$\boxed{x=7}$$

~~$$9 = x^2 - 3x + 12$$~~

~~$$0 = x^2 - 3x + 3$$~~

33

$$x + \frac{1}{x} = \frac{13}{6}$$

$$\text{LCD} = 6x$$

$$6x \left(x + \frac{1}{x} \right) = \frac{13}{6} \cdot 6x$$

$$6x^2 + 6 = 13x$$

$$6x^2 - 13x + 6 = 0$$

$$(2x-3)(3x-2) = 0$$

$$2x-3=0$$

$$\boxed{x = \frac{3}{2}}$$

$$3x-2=0$$

$$\boxed{x = \frac{2}{3}}$$

~~$$6x \cdot \left(\frac{x^2}{x} + \frac{1}{x} \right) = \frac{13}{6} \cdot 6x$$~~

~~$$6x^2 + 6 = 13x$$~~

34

x = Speed of current

	distance	rate	time
downstream	80	$6+x$	$\frac{80}{6+x}$
upstream	40	$6-x$	$\frac{40}{6-x}$

time is the same

$$\frac{80}{6+x} = \frac{40}{6-x} \rightarrow 80(6-x) = 40(6+x)$$

$$2(6-x) = (6+x)$$

$$12-2x = 6+x$$

$$6 = 3x$$

$$\boxed{2 = x}$$

35

Nina rate : $\frac{1}{2x}$

Mark rate : $\frac{1}{5x}$

x = time to do job together

$$\frac{1}{2}x + \frac{1}{5}x = \frac{5}{10}x + \frac{2}{10}x = 1$$

$$\frac{7}{10}x = 1$$

$$\boxed{x = \frac{10}{7}}$$

36

$$y = kx$$

Find k when $y = 20$ & $x = 2$

$$20 = k \cdot 2$$

$$10 = k$$

Find y when $x = 5$

$$y = 5x$$

$$y = 5 \cdot 5 = \boxed{25 = y}$$

37

$$W = v^2 \cdot k$$

Find k when $W = 24$
 $v = 6$

$$24 = (6)^2 \cdot k$$

$$\frac{24}{36} = k$$

$$\frac{2}{3} = k$$

Find W when $v = 10$

$$W = \frac{2}{3}v^2$$

$$W = \frac{2}{3} \cdot 10$$

$$\boxed{W = \frac{20}{3}}$$

(38)

$$t = \frac{k}{r}$$

Find k

$$4 = \frac{k}{60}$$

$$240 = k$$

Find t when $r = 45$

$$t = \frac{240}{45}$$

$$\boxed{t = 16/3}$$

(39)

$$y = \frac{k}{x^2}$$

Find k

$$12 = \frac{k}{(3)^2}$$

$$108 = k$$

Find y when $x = 5$

$$y = \frac{108}{(5)^2} = \boxed{\frac{108}{25}}$$